

CREST Status Report - 18 June, 1997

Overview

Principal efforts of the Consolidated Reporting of EarthquakeS and Tsunamis (CREST) project during the second half of 1997 were devoted to project organization, instrument testing, software development, and siting. In this status report we review progress in each of these areas and present a revised budget estimate. In the next quarter we will issue requisitions for equipment, begin field reconnaissance for site selection, and continue software installations. Actual site installations await receipt of field equipment.

Instrument Testing and Procurement

As described in the CREST proposal, we will procure three types of instruments for the CREST project. To ensure that strong ground motion does not exceed the dynamic range of the recording system, we will be installing at each site a tri-axial accelerometer. All sites will also record data with broadband velocity sensors to obtain data on regional earthquakes and teleseisms. To achieve the full dynamic range of these sensors, we will record data from these sensors on 24-bit data loggers. A small subset of the CREST network will operate USNSN-class instruments on satellite telemetry to ensure that some data is available to the tsunami warning centers (TWC's) should terrestrial communications to regional seismic networks (RSN's) be disrupted by a major quake.

We first conducted an extensive review of all available instrumentation and spoke with vendors to identify which products would achieve the goals of the project, yet enable us to stay within the budget for the project. Based on this review, we identified a subset of instruments for testing. We performed noncoherent noise floor tests (0.05 - 200 sec) on pairs of broadband sensors, long- and short-period noise floor tests on accelerometers, and noncoherent and linearity tests on data loggers. We have comparable test data on 5 broadband sensors, 3 accelerometers, and 6 dataloggers.

On June 2 we met to review the test data and write specifications for procurement. We were able to identify several products that would be acceptable, but found it necessary to obtain more information from some of the vendors to clarify whether it would be possible to also collect tide gauge data at a few samples/sec in addition to the six seismic channels. We expect to issue requisitions during the first week of July. We do not expect delivery of the broadband sensors for 6 months following award of contract. Because of weather conditions in Alaska, most of the instrumentation to be installed for the AEIC and ATWC will be delayed until the summer of 1998. Installation of equipment at other RSN's will proceed as soon as equipment is delivered. Most procurement will be done by Menlo Park, except for equipment installed by AEIC and HVO.

Software and Communications Development

We developed the specifications for Version 1.0 of the Core Tsunami System (CTS), the software that

acquires the digital data, locates earthquakes, exchanges information among CREST participants, and computes ancillary information about large quakes (moment tensors, shaking maps, *etc.*). The software will be installed at each RSN, the USNSN, and both TWC's, even though some of these networks operate non-Earthworm software. Interface software will be written to enable these disparate software environments to communicate with the CTS. We have identified the type of computing hardware on which the CTS will operate. Most software components of the CTS system are now operational, but several are still in development. We anticipate completion of the waveform exchange module by the end of June. We are currently designing the framework modules to enable us to easily implement seismological algorithms that compute moment tensors, broadband moment magnitudes from initial P-waves, Ml, create seismogram snapshots, and generate shaking maps.

We installed the current version of the CTS at the University of Washington (PNSN) the first week of June and are installing a CTS at the ATWC the third week in June. CTS systems are already functioning at the NCSN in Menlo Park and at the AEIC in Fairbanks. We cannot begin writing software to acquire continuous digital data until a datalogger is selected, because dataloggers output their data in a different formats. Upon completion of this task we will then install additional computers with software to acquire the continuous digital data from field units. Computers have been selected to replace the aging HVO analog data acquisition machines and will be procured in the next few weeks.

In the initial phase of the CREST project we intend to link up networks only via the Internet and intranets, such as DOINET and DREN. Investigations are underway to identify the most robust and cost-effective way to connect the ATWC to the DOINET. We anticipate installing a high-speed (T1?) link from Palmer to Anchorage with a backup connection to Fairbanks via a high-speed (56 Kbit) dial-up system. We are also working to connect the AEIC directly to the DOINET. Other RSN's, the PTWC, and the USNSN already have suitable network connections.

Site Selection

Tentative sites have been selected for either upgrade or new installation in Year 1. Actual site selection will depend on a field visits to each site region to collect seismic noise samples using broadband instruments. We anticipate completing most noise surveys this summer. The attached budget indicates the location and number of sites to be installed with Year 1 funds for each network. In addition, we have developed a website with specific guidelines for installation of the broadband sensors. Hardware will be installed at each RSN/TWC in Year 1 to gain operational experience.

USNSN-class sites are scheduled for installation at Shemya (AK), Sitka (AK), and Cheeka Peak (WA). These sites will have broadband sensors (0.02-120 sec) and dataloggers that require A/C power. Most CREST sites will have a less expensive broadband sensor (0.02-60+ sec) and low-power data loggers that can operate without A/C power. In Alaska the CREST project intends to incorporate existing IDA/IRIS/GSN broadband stations at Adak, Kodiak, and College, as well as the site at ATWC. Four existing, dial-up, broadband stations in Washington and Oregon will be converted to continuous telemetry in Year 2. A GSN station already exists in Corvallis, OR. An extensive network of continuous broadband stations exists in California, operated by UCB and Caltech; we will attempt to incorporate these data into

the CREST system in Year 2. In Hawaii a GSN station is planned for Pohakuloa (Big Island) and the Kipapa (Oahu) is already available to PTWC.

Providing Earthquake Information to State Agencies

The USGS and the University of Washington arranged a visit on June 17 of DOGAMI staff to Seattle. The UW/USGS staff conducted a short workshop on real-time seismic network operations. A version of CUBE, a real-time earthquake information system designed by Caltech and the USGS in Pasadena, was installed on a DOGAMI computer for use in their Portland office. Over the course of the tsunami project, the CUBE system will be replaced by displays tailored by CREST to the needs of the State Agency partners. The UW and the USGS plan on similar workshops for Oregon Emergency Management, Washington DNR, and Washington Emergency Management. A coordinated effort to find out the information needs and communications capabilities of all OES recipients will be deferred to Year 2.

Year 1 Budget (revised)

Administrative		Subtotal
NOAA 2.4% Overhead	24.0	
USGS 10% Overhead	97.6	
PNSN Programmer Salary support	21.0	
AEIC Salary, benefits, overhead, indirect costs	121.3	263.9
General Project Costs		
Initial site visits to ATWC, PTWC, HVO, USNSN	16.0	
CREST organizational meeting at SSA, Honolulu	4.5	
Instrumentation testing & review meeting	6.1	
Travel to THM Fed./State Working Group mtgs	2.9	
Software Consultant	12.0	41.5
ATWC (2 sites in Year 1)		

Central Site CTS computer	16.0	
CTS-to-ATWC Interface computer & UPS	4.5	
Central site data-logger hardware	1.5	
Travel for Installation of CTS computers (2 trips)	5.8	
Sitka, AK		
Travel (installation)	4.5	
Equipment* (accelerometers, broadband, datalogger)	30.7	
Site Preparation and incidentals (modem, UPS, etc.)	1.5	
Shemya, AK		
Travel (installation)	5.6	
Equipment* (accelerometers, broadband, datalogger)	30.7	
Site Preparation and incidentals (modem, UPS, etc.)	1.5	101.2
AEIC (4 sites)		
Travel to Palmer	2.9	
Central Site CTS computer	16.0	
Chitina, AK		
Travel (survey & installation)	3.4	
Equipment** (accelerometers, broadband, datalogger)	23.2	
Site Preparation and incidentals (modem, UPS, etc.)	6.0	
Saint Paul Island, AK		
Travel (survey & installation)	9.0	
Equipment** (accelerometers, broadband, datalogger)	23.2	
Site Preparation and incidentals (modem, UPS, etc.)	6.0	

Unalaska, AK

Travel (survey & installation)	7.9	
Equipment** (accelerometers, broadband, datalogger)	23.2	
Site Preparation and incidentals (modem, UPS, etc.)	6.0	

Tin City, AK

Travel (survey & installation)	6.1	
Equipment** (accelerometers, broadband, datalogger)	23.2	
Site Preparation and incidentals (modem, UPS, etc.)	6.0	162.1

NCSN (3 sites)

CTS Development computer	19.0	
Interface hardware to datalogger	7.3	

Horse Mountain, CA

Travel (survey & installation)	1.2	
Equipment** (accelerometers, broadband, datalogger)	23.2	
Site Preparation and incidentals (modem, UPS, etc.)	6.0	

Mt. Pierce, CA

Travel (survey & installation)	1.2	
Equipment** (accelerometers, broadband, datalogger)	23.2	
Site Preparation and incidentals (modem, UPS, etc.)	6.0	

Cahto Peak, CA

Travel (survey & installation)	1.2	
Equipment** (accelerometers, broadband, datalogger)	23.2	
Site Preparation and incidentals (modem, UPS, etc.)	6.0	117.5

PNSN (3 sites)

Central site CTS computer 16.0

Interface hardware to datalogger 7.3

Travel from MP for interfacing CTS to PNSN software 3.0

Site 1 (Ranney Well, WA?)

Travel (survey & installation) 1.3

Equipment** (accelerometers, broadband, datalogger) 23.2

Site Preparation and incidentals (modem, UPS, etc.) 6.0

Site 2 (Green Mountain, WA?)

Travel (survey & installation) 1.3

Equipment** (accelerometers, broadband, datalogger) 23.2

Site Preparation and incidentals (modem, UPS, etc.) 6.0

Cheeka Peak, WA

Travel (survey & installation) 2.5

Equipment* (acc., broadband, datalogger, VSAT) 34.7

Site Prep & incidentals (power, enclosures) 3.5 128.0

HVO (2 sites)

Central site CTS computer 16.2

Central site CUSP on-line computer replacement 20.0

Travel from Pasadena for CUSP computer installation 6.0

Travel from Menlo for interfacing CTS to CUSP 3.0

Kahuku, Big Island

Equipment** (accelerometers, broadband, datalogger)	23.2	
Site Preparation and incidentals (modem, UPS, etc.)	10.0	
Uwekahuna Vault, Big Island		
Equipment** (accelerometers, broadband, datalogger)	23.2	101.6
PTWC		
Central site CTS computer	13.9	
Travel from Menlo for interfacing CTS to PTWC	1.8	15.7
Reserve Funds	68.5	68.5

TOTAL		1000.0

* Accelerometer=2.7, Broadband=16.0, Datalogger=12.0

** Accelerometer=2.7, Broadband=8.5, Datalogger=12.0

Contact: [David Oppenheimer](#), Project Chief, Northern California Seismic Network